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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/812,113	03/29/2004	Ming Li	MATG-393US	1523

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RATNERPRESTIA
P O BOX 980
VALLEY FORGE, PA 19482-0980

EXAMINER	
ELVE, MARIA ALEXANDRA	
ART UNIT	**PAPER NUMBER**
1725	

DATE MAILED: 10/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/812,113	LI ET AL.	
	Examiner	Art Unit	
	M. Alexandra Elve	1725	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,5-14,16-20,22,23,25-29 and 32-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5-14,16-20,22,23,25-29 and 32-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

In view of Applicants comments, 9/27/06, the examiner has reopened prosecution. The following office action is based on claims 3/30/06.

Claim Rejections - 35 USC § 112

Claim 11 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The "array of sub-beams has a density of 1/N times an image density" is not taught in the specification.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 5, 7-14, 17-20, 22-23, 25-29 & 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (USPN 6,433,303) in view of Liu et al. (USPN 6,433,305) and Smith (USPN 5,296,673).

Liu et al. ('303) discloses an apparatus and method for forming an array of microcavity holes using a laser. An optical mask divides the beam into multiple beams

(sub-beams) and a lens system focuses them. The device generates multiple beams of one diameter, which are then magnified (by a factor less than one) to produce multiple beams having a diameter less than the first diameter. A diffractive optical element may be used in place of the optical mask. Femtosecond laser pulses may be used. The imaging of the mask onto the workpiece requires the use of a two-lens system. The mask is placed in the focal plane of the lens 122 and the workpiece is placed in the focal place of another lens 126. Using this lens system the image magnification ratio is given by the ratio of the focal length of the two lenses, that is, M=f2/f1. The workpiece is mounted onto an XYZ translation stage. The turning mirror 124 before the objective lens allows a microscope imaging set up including a CCD camera imaging lens 138 and CCD camera 140 to monitor the drilling in real time. The system may include a turning mirror mounted on a motor. The system forms a laser light pattern on the workpiece, which is substantially the same as the apertures in the mask 120 but magnified in its linear dimensions by a factor of M. a diffractive optical element (DOE) and a telecentric lens may be used in place of the mask. A DOE with a focusing lens can generate a desired pattern on the surface of the workpiece. (abstract, figures, col. 2, lines 35-65, col. 3, lines 5-60, col. 4, lines 30-35, col. 5, lines 5-20, col. 6, lines 10-15)

Liu et al. ('303) does not teach pitch or demagnification.

Liu et al. ('305) discloses an apparatus and method of laser machining using an ultra fast laser. A plurality of holes with a pitch less than the wavelength of the laser are drilled into the workpiece. A femtosecond laser is used with 750 nm. Holes diameters

may be 500 nm or 750nm. Holes may be of a sub-wavelength pitch. (abstract, figures. col. 1, lines 35-65, col. 2, lines 50-60, col. 3, lines 5-15, col. 5, lines 1-15).

It would have been obvious to one of ordinary skill in the art at the time of the invention to determine and use the pitch as taught by Liu et al. ('305) in the Liu et al. ('303) system because it fulfills the objective of micromachining, that is, formation of microcavities.

Smith discloses laser machining in which a target is ablated (drilled) in order to form holes. The UV light passes through a mask into a telecentric lens system, which projects a reduced size image of the mask onto the workpiece. The beam may be scanned, preferably by deflection using a mirror, which is moved linearly to translate the laser beam across the surface of the mask. A linear demagnification of 5:1 is achieved with a minimum number of optical elements in order to maximize the proportion of the laser light transmitted to the workpiece. Linear demagnification of 5:1 from the mask through the lenses to the on-target image of the mask is preferred for ablating the apertures in those laminates although other demagnifications could be used for example ranging from 1:1 to 10:1. Resolution of 1 to 10 micrometers, preferably about 2 micrometers and distortion of only 1 to 30, preferably about 2 micrometers at full image field are preferred. The workpiece is moved using an XYZ plane. This allows the patterns to be step and repeated. (abstract, figures, col. 1, lines 10-15, 68, col. 2, lines 1-2, 40-45, col. 3, lines 1, 55-68, col. 4, lines 1-2, 22, 35-40, 48-55, col. 5, lines 5-10)

It would have been obvious to one of ordinary skill in the art at the time of the invention to use demagnification as taught by Smith in the Liu et al. ('303) system because the fine structures which may be formed on the workpiece.

Claims 6 & 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. ('303), Liu et al. ('305) and Smith, as stated in the above paragraph and further in view of Noddin (USPN 5,973,290).

Liu et al. ('303), Liu et al. ('305) and Smith does not teach the use of harmonic crystal.

Noddin discloses a laser drilling system in which the laser beam is formed using a lithium triborate crystal for harmonic generation. (abstract)

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a crystal for harmonic generation and thus laser beam generation, as taught by Noddin in the Liu et al. ('303), Liu et al. ('305) and Smith system because it is merely a part of the laser generation system.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Alexandra Elve whose telephone number is 571-272-1173. The examiner can normally be reached on 6:30-3:00 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

October 2, 2006.

M. Alexandra Elve
Primary Examiner 1725